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Description

This invention relates to an electromagnetic identification system.

Electromagnetic identification systems of the kind to which the invention relates are disclosed in, for example., Netherlands patent application 77,11891 and in US patent 4,333,072.

These prior electromagnetic identification systems comprise a transmitter for generating an electromagnetic interrogation field in a detection zone, at least one passive responder capable of disturbing said interrogation field, and detection means for detecting a disturbance of the interrogation field caused by a responder, the responders comprising a single receiver circuit which in response to an interrogation field, via rectifier means, can supply energy to active digital encoding means comprising a binary-code defining means, said encoding means being arranged, in operation, through a switch means, to vary the electrical characteristics of said receiver circuit in the rhythm of the binary code to generate a code signal that is detectable by said detection means, said encoding means being arranged to control the switch member during pre-determined periods of time for varying the electrical characteristics of said receiver circuit, which pre-determined periods of time alternate with intervals during which the electrical characteristics of the receiver circuit are not affected.

It is also known for the second responders of an electromagnetic identification system to be arranged so that, after the actual production process of the responder, the code of each responder can, at least in part, be programmed or re-programmed. In the past, for example, it has been proposed for the responders to be arranged so that the desired code can be programmed in the responder by breaking certain electrical connections mechanically from the outside. It has also been proposed to make use of fusible links, which can be selectively broken by the wireless supply of sufficient energy.

Furthermore, it has been proposed in general, for example., in German patent application 3,412,610, German patent application 3,412,588, and the International Patent Application WO 86/00498, to use a memory means in a coded responder, in which data can be stored or changed by wireless means.

Finally EP-A-0111753 discloses an electromagnetic detection system in which passive coded responders having a single resonant circuit are used. Also the code of said responders may be (re)programmed by means of a modulated electromagnetic field. To this end a transmitter can under control of a suitable programmer provide an electromagnetic field modulated in accordance with the code to be programmed in the code defining means of the responders.

The known responders however are not of the

type generating in an interrogation field their code during predetermined periods of time alternating with intervals during which no coded signal will be generated in the resonant circuit even though the responder is still in the interrogation field.

Moreover in the known system special means in the responders will be required that are able to distinguish between a modulated field meant for (re)programming the code and a modulated interrogation field which is the result of the activity of a code responder.

It is an object of the present invention to provide a practical technique for programming or re-programming the code of a responder of an electromagnetic identification system of the kind in which, in operation, the responders generate a code signal with intervals.

For this purpose, according to the present invention, an electromagnetic identification system of the above kind is characterized in that said encoding means comprise a decoding section known in itself which, in response to a modulation of the interrogation field, can, at least in part, change the binary code defined by said code-defining means, and that these is provided a transmitter comprising a programmer also known in itself for providing such modulation, said transmitter being arranged, in operation, to generate a modulated interrogation field during said pre-determined intervals.

The invention will now be described in more detail with reference to the accompanying drawings, in which:

Fig. 1 diagrammatically shows one example of a prior art identification system;

Fig. 2 diagrammatically shows one embodiment of an identification system according to the present invention;

Fig. 3 diagrammatically shows signal distortion occurring in the identification system as shown in Fig. 2; and

Fig. 4 diagrammatically shows a variant of a responder for an identification system according to the present invention.

Fig. 1 diagrammatically shows an example of a prior art identification system comprising a transmitter 1 which by means of an aerial 2 can generate an interrogation field in a detection zone. Furthermore, detection means 3 are provided which, in this example, are connected to the same aerial as the transmitter, and can detect the field disturbance caused by a responder 4 present in the detection zone.

Responder 4 comprises a receiver circuit 5, which in this example is a tuned resonance circuit LC, but may alternatively be a wide-band circuit or an aerial, if desired.

Via a rectifier 6, shown diagrammatically, receiver circuit 5 provides supply energy to digital encoding means 7 when the responder is in an interrogation field. Furthermore, a buffer capacitor 8 is provided. The encoding means in operation provide a

binary code signal that is unique for the responder in question or for the group to which the responder belongs. The code signal controls a switch member 9, for example, a transistor. The switch member affects the electrical characteristics of the receiver circuit 5 in the rhythm of the code signal. Thus, for example, the resonance frequency can be changed by short-circuiting a coil or capacitor forming part of the circuit. In the example shown, the receiver circuit is short-circuited via a resistor 10 in the rhythm of the code.

As, during the short-circuiting of the receiver circuit 5, the voltage provided by the rectifier falls off, at least in part, the responder is arranged so that the switch means can only affect the receiver circuit during certain periods of time. These periods of time alternate with pre-determined intervals during which the switch means is not energized. During these intervals, the buffer capacitor 8 can be fully charged again.

According to the present invention, these intervals can be utilized to advantage for sending out the information required for programming or re-programming the code of a responder, defined by a code defining means or memory of the encoding means.

For this purpose, the code defining means should naturally be re-programmable, at least in part. Such a code defining means may, for example, comprise a RAM or, for example, an E(E)PROM. In the case of a RAM, an auxiliary battery is often required.

Fig. 2 diagrammatically shows an example of an identification system according to the present invention, arranged so that the code of a responder can be programmed or changed, at least in part, after the actual production process. Similar parts are designated by the same reference numerals as used in Fig. 1.

The transmitter 1 now comprises a programmer 21, by means of which the interrogation field can be modulated during the pre-determined intervals in which the switch means 9 is not operative.

The modulated signal is supplied by the receiver circuit 5, which in this example only comprises a coil L, to the encoding means 7, via a line 22. The encoding means now comprise a decoding section 23, which decodes the signal received and, with the signals thus obtained, changes the contents of the code defining means 24.

In order to ensure that the modulation of the interrogation field endangers the provision of energy to the active responder circuits as little as possible, the transmission energy is preferably set as high as possible during the (re)programming of the responder. For this purpose the transmitter is provided with adjusting means 25, shown diagrammatically, by means of which the energy transmitted by the transmitter through aerial 2 can be adjusted.

In order to determine the optimum transmission energy level for the (re)programming, the transmission energy is gradually increased from a low value.

At a certain threshold value, the supply voltage across the buffer capacitor 8 in a responder being programmed will reach such a level that the Zener diode 26, which for security reasons will often be present anyway, becomes operative. At that moment there will be a sudden change in the amount of field energy absorbed by the responder. Such a leapwise change can be detected in a simple manner by detection means 3. The transmitter can then be adjusted, for example automatically through a line 27, to a level at which the Zener diode 26 is just not operative.

If desired, the transmitter can be arranged so that after energizing the programmer 21, the variation of the transmission energy and the subsequent adjustment of the optimum transmission energy level take place fully automatically.

Fig. 3 shows, at a, the signal across the receiver circuit of a responder during normal operation and, at b, during the (re)programming. Fig. 3a shows two periods of time C1, during which a responder generates a coded signal in an interrogation field. The periods of time C1 alternate with pre-determined intervals P, during which energy is transferred only.

Fig. 3b shows that, in the intervals P, the signal is modulated for (re)programming a responder in the intervals P. As stated before, the transmission energy is then set at an optimum value. In addition, the programmer is preferably arranged so that the modulation depth caused by the programmer does not exceed a pre-determined value, e.g., 50% of the amplitude.

Besides by means of detection of the field absorption, the transmission of the encoded information from the responder can also be effected by switching from transmission to receiving, and this at the same frequency, in the periods of time C1 in which this transfer is to take place. For this purpose, the coil or aerial of the transmitter can be switched to a receiver in these periods. Also, of course, use can be made of a receiver with its own coil or aerial.

To enable this form of transfer, which has the advantage of being less sensitive to interference as a result of, for example, the presence of metal, the electric circuit in the responder has to provide itself for the transfer signal with the correct frequency in the periods of time in which no transmission signal is present. Depending on the amount of energy in the energy buffer, this can also comprise a plurality of time zones.

Fig. 4 shows diagrammatically a responder suitable for this purpose. The receiver circuit of the responder is connected to an amplifier circuit 40, so that, upon receiving a signal from the transmitter this amplifier circuit passively follows the phase of the transmission signal presented, but when the transmission field drops out, the amplifier circuit will begin to actively oscillate at the same frequency.

The transfer of the coded information from the

responder to the transceiver can then take place in the same manner as in the transfer through modulation of the field absorption, namely, by modulating the electrical characteristics of the receiver circuit in the responder. Also, to save energy, an inhibit line 41 could be provided in the amplifier, for example, by giving it the form of a so-called "NAND" gate. This last is especially of importance if a battery is added to increase the detection range.

It is observed that, after reading the above, various modifications will readily occur to those skilled in the art. Thus, a responder could be arranged so that only a portion of the code can later be changed. If desired, a portion of the code defining means or memory can be used to indicate that in this portion and/or another portion the code must not be changed. Also, a responder can be arranged so that a portion of the code stored in the code defining means can be varied under the influence of signals from one or more sensors coupled to the responder. These may be, for example, sensors for physical or (bio)chemical parameters, such as blood pressure, temperature, pressure, heart rate, eye pressure, concentration of certain substances, etc. Such modifications are to be considered to be within the scope of the present invention.

Claims

1. An electromagnetic identification system comprising a transmitter (1) for generating an electromagnetic interrogation field in a detection zone, at least one passive responder (4) capable of disturbing said interrogation field, and detection means (3) for detecting a disturbance of the interrogation field caused by a responder (4), the responders (4) comprising a single receiver circuit (5) which in response to an interrogation field, via rectifier means (6), can supply energy to active digital encoding means (7) comprising a binary-code defining means (24), said encoding means (7) being arranged, in operation, through a switch means (9), to vary the electrical characteristics of said receiver circuit (5) in the rhythm of the binary code to generate a code signal that is detectable by said detection means (3), said encoding (7) means being arranged to control the switch member (9) during pre-determined periods of time (CI) for varying the electrical characteristics of said receiver circuit (5), which pre-determined periods of time alternate with intervals (P) during which the electrical characteristics of the receiver circuit (5) are not affected, characterized in that said encoding means (7) comprise a decoding section (23) known in itself which in response to a modulation (M) of the interrogation field can, at least in part, change the binary code defined by said code-defining means (24), and that there is provided a transmitter (1) comprising a programmer

(21) also known in itself, for providing such modulation (M: said transmitter (1) being arranged, in operation, to generate, a modulated interrogation field during said predetermined intervals (P).

2. An electromagnetic identification system as claimed in claim 1, characterized in that the transmitter (1) comprising a programmer (21) is the same transmitter (1) which normally generates an interrogation field in a detection zone.

3. An electromagnetic identification system as claimed in claim 1, characterized in that the transmitter (1) comprising the programmer (21) comprises adjusting means (25) for varying the energy transmitted, the responder (4) comprising a Zener diode (26) which limits the supply voltage provided by the rectifier means (6) to a pre-determined threshold value, and the adjusting means (25) being arranged to adjust the energy transmitted to an energy level corresponding to said pre-determined threshold value of the supply voltage during programming.

4. An electromagnetic identification system as claimed in claim 3, characterized in that the programmer (21) is arranged, starting from the energy level corresponding to the pre-determined threshold value of the supply voltage, to effect an amplitude modulation (M) of the interrogation field with a modulation depth not exceeding a pre-determined maximum value.

5. An electromagnetic identification system as claimed in claim 3 or 4, characterized in that the detection means (3) are arranged, upon variation of the energy transmitted, to detect a sudden change of the amount of energy absorbed by a responder (4), and to provide a corresponding signal to the adjusting means (25).

6. An electromagnetic identification system as claimed in any of the preceding claims, characterized in that the binary-code defining means (24) comprises an EEPROM.

7. An electromagnetic identification system as claimed in any of the preceding claims, characterized in that the transmitter (1) is arranged to intermittently generate an interrogation field and that the responders (4) are arranged to generate a coded signal after the interrogation field drops out.

8. An electromagnetic identification system as claimed in claim 7, characterized in that said responders (4) are provided with an amplifier (40) which after the interrogation field drops out, together with the receiver circuit (5), forms an oscillator tuned to the frequency of the interrogation field and withdrawing energy from an energy buffer (8) provided in said responder (4).

9. An electromagnetic identification system as claimed in claim 8, characterized in that said amplifier (40) comprises an inhibit input that is energized so long as the responder withdraws energy from the receiver circuit (5).

10. A responder for use in an electromagnetic identification system as claimed in any of claims 1-9.

11. A method of programming the code of a coded responder (4) which forms part of an electromagnetic identification system and is arranged to form supply energy from an interrogation field through rectifier means (6) and a voltage limiter, and in response to an interrogation field to generate a code signal during pre-determined periods of time (CI) alternating with time intervals (P), said code signal being in accordance with a digital code defined by a programmable code defining means (24) forming part of active digital coding means (7) including a decoding section (23), characterized in that a transmitter (1) by means of which an interrogation field can be generated is provided in a manner known as such with a programmer (21) for modulating said interrogation field; that the energy transmitted by the transmitter (1) is varied when a responder (4) to be programmed is brought near the transmitter; that the energy level at which a sudden leap occurs in the energy absorbed by the responder (4) is detected; that at least during the intervals (P) when the responder (4) does not generate a code signal, the transmitter (1) is adjusted to an energy level corresponding to the detected energy level; and that subsequently, during the intervals (P), the programmer (21) is energized to modulate the interrogation field in accordance with a desired code, which code is decoded by the decoding section (23) and written into the code defining means (24).

Patentansprüche

1. Elektromagnetisches Identifizierungssystem mit einem Sender (1) zum Erzeugen eines elektromagnetischen Abfragefeldes in einer Erkennungszone, wenigstens einem passiven Responder (4), der in der Lage ist, das Abfragefeld zu stören, und einer Erkennungseinrichtung (3) zum Erkennen einer durch den Responder (4) verursachten Störung des Abfragefeldes, wobei der Responder (4) eine einzelne Empfängerschaltung (5) aufweist, die, in Reaktion auf ein Abfragefeld, einer aktiven Digitalkodiereinrichtung (7), die eine Binär-Kodedefinierungseinrichtung (24) aufweist, Energie über eine Gleichrichtereinrichtung (6) zuführen kann, wobei die Kodiereinrichtung (7) derart ausgelegt ist, daß sie im Betrieb über eine Schalteinrichtung (9) die elektrische Charakteristik der Empfängerschaltung (5) im Rhythmus des Binärkodes verändert, um ein Kodesignal zu erzeugen, das von der Erkennungseinrichtung (3) erkennbar ist, wobei die Kodiereinrichtung (7) derart ausgebildet ist, daß sie die Schalteinrichtung (9) während vorbestimmter Perioden (CI) zum Verändern der elektrischen Charakteristik der Empfängerschaltung (5) steuert, wobei die vorbestimmten Perioden mit Intervallen (P) wechseln, während denen die elektrische

Charakteristik der Empfängerschaltung (5) nicht beeinflußt ist, dadurch gekennzeichnet, daß die Kodiereinrichtung (7) einen an sich bekannten Dekodierbereich (23) aufweist, der in Reaktion auf eine Modulation (M) des Abfragefeldes den durch die Kodedefinierungseinrichtung (24) definierten Binärkode wenigstens teilweise verändern kann, und daß ein Sender (1) vorgesehen ist, der einen ebenfalls an sich bekannten Programmierer (21) zum Bewirken einer solchen Modulation (M) aufweist, wobei der Sender (1) derart ausgebildet ist, daß er im Betrieb während der vorbestimmten Intervalle (P) ein moduliertes Abfragefeld erzeugt.

2. Elektromagnetisches Identifizierungssystem nach Anspruch 1, dadurch gekennzeichnet, daß der einen Programmierer (21) aufweisende Sender (1) derselbe Sender (1) ist, der normalerweise ein Abfragefeld in einer Erkennungszone erzeugt.

3. Elektromagnetisches Identifizierungssystem nach Anspruch 1, dadurch gekennzeichnet, daß der einen Programmierer (21) aufweisende Sender (1) eine Einstellungseinrichtung (25) zum Verändern der übertragenen Energie aufweist, der Responder (4) eine Zener-Diode (26) aufweist, welche die von der Gleichrichtereinrichtung (6) gelieferte Speisespannung auf einen vorbestimmten Schwellenwert begrenzt, und die Einstellungseinrichtung (25) derart ausgebildet ist, daß sie die übertragene Energie auf einen Energiepegel einstellt, der dem vorbestimmten Schwellenwert der Speisespannung während des Programmierens entspricht.

4. Elektromagnetisches Identifizierungssystem nach Anspruch 3, dadurch gekennzeichnet, daß der Programmierer (21) derart ausgebildet ist, daß er, ausgehend von dem dem vorbestimmten Schwellenwert der Speisespannung entsprechenden Energiepegel, eine Amplitudenmodulation (M) des Abfragefeldes bewirkt, wobei die Modulationstiefe einen vorbestimmten Spitzenwert nicht überschreitet.

5. Elektromagnetisches Identifizierungssystem nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß die Erkennungseinrichtung (3) derart ausgebildet ist, daß sie, bei einer Veränderung der übertragenen Energie, eine plötzliche Veränderung der von einem Responder (4) absorbierten Energie erkennt und daß sie ein entsprechendes Signal an die Einstellungseinrichtung (25) liefert.

6. Elektromagnetisches Identifizierungssystem nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Binär-Kodedefinierungseinrichtung (24) ein EEPROM aufweist.

7. Elektromagnetisches Identifizierungssystem nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Sender (1) derart ausgebildet ist, daß er intermittierend ein Abfragefeld erzeugt und daß die Responder (4) derart ausgebildet sind, daß sie nach dem Ausfall des Abfragefeldes ein Kodesignal erzeugen.

8. Elektromagnetisches Identifizierungssystem nach Anspruch 7, dadurch gekennzeichnet, daß die Responder (4) mit einem Verstärker (40) versehen sind, der nach dem Ausfall des Abfragefeldes zusammen mit der Empfängerschaltung (5) einen auf die Frequenz des Abfragefeldes abgestimmten Oszillator bildet und Energie aus einem in dem Responder (4) vorgesehenen Energiepuffer (8) abzieht.

9. Elektromagnetisches Identifizierungssystem nach Anspruch 8, dadurch gekennzeichnet, daß der Verstärker (40) einen Spereingang aufweist, der so lange eingeschaltet ist wie der Responder Energie aus der Empfängerschaltung (5) abzieht.

10. Responder zur Verwendung in einem elektromagnetischen Identifizierungssystem nach einem der Ansprüche 1 bis 9.

11. Verfahren zum Programmieren des Codes eines kodierten Responders (4), der Teil eines elektromagnetischen Identifizierungssystems ist und derart ausgebildet ist, daß er über eine Gleichrichtereinrichtung (6) und einen Spannungsbegrenzer Versorgungsenergie aus einem Abfragefeld bildet, und in Reaktion auf ein Abfragefeld während vorbestimmter, mit Zeitintervallen (P) wechselnder Perioden (CI) ein Kodesignal erzeugt, wobei das Kodesignal einem Digitalcode entspricht, der von einer programmierbaren Kodedefinierungseinrichtung (24) definiert ist, die Teil einer Digitalkodiereinrichtung (7) mit einem Dekodierbereich (23) bildet, dadurch gekennzeichnet, daß ein Sender (1), mittels welchem ein Abfragefeld erzeugt werden kann, in an sich bekannter Weise mit einem Programmierer (21) zum Modulieren des Abfragefeldes versehen ist; daß die von dem Sender (1) übertragene Energie verändert wird, wenn ein zu programmierender Responder (4) in die Nähe des Senders gebracht wird; daß der Energiepegel, bei dem ein plötzlicher Sprung in der von dem Responder (4) absorbierten Energie auftritt, erkannt wird; daß wenigstens während der Intervalle (P), in denen der Responder (4) kein Kodesignal erzeugt, der Sender (1) auf einen Energiepegel eingestellt wird, der dem erkannten Energiepegel entspricht; und daß anschließend, während der Intervalle (P), der Programmierer (21) eingeschaltet wird, um das Abfragefeld gemäß einem gewünschten Kode zu modulieren, der von dem Dekodierbereich (23) dekodiert und in die Kodedefinierungseinrichtung (24) eingeschrieben wird.

Revendications

1. Système d'identification électromagnétique comprenant un émetteur (1) pour produire un champ d'interrogation électromagnétique dans une zone de détection, au moins un répondeur passif (4) pouvant perturber ledit champ d'interrogation, et un moyen de détection (3) pour détecter une perturbation du champ

d'interrogation provoqués par un répondeur (4), les répondeurs (4) comprenant un circuit récepteur unique (5) qui en réponse à un champ d'interrogation, par l'intermédiaire d'un moyen de redresseur (6), peut délivrer de l'énergie pour activer un moyen de codage numérique (7) comprenant un moyen de définition de code binaire (24), ledit moyen de codage (7) étant agencé, en fonctionnement, par l'intermédiaire d'un moyen de commutation (9), pour faire varier les caractéristiques électriques dudit circuit récepteur (5) au rythme du code binaire afin de produire un signal de code qui est détectable par ledit moyen de détection (3), ledit moyen de codage (7) étant agencé pour commander le moyen de commutation (9) pendant des périodes de temps prédéterminées (CI) pour faire varier des caractéristiques électriques dudit circuit récepteur (5), lesquelles périodes prédéterminées de temps alternent à des intervalles (P) pendant lesquels les caractéristiques électriques du circuit récepteur (5) ne sont pas modifiées, caractérisé en ce que le moyen de codage (7) comprend une section de détection (23) connue en elle-même, qui en réponse à une modulation (M) du champ d'interrogation peut, au moins en partie, modifier le code binaire défini par ledit moyen de définition de code (24), et en ce qu'il est prévu un émetteur (1) comprenant un programmeur (21) également connu par lui-même, pour délivrer une telle modulation (M), ledit émetteur (1) étant agencé, en fonctionnement, pour produire un champ d'interrogation modulé pendant lesdits intervalles prédéterminés (P).

2. Système d'identification électromagnétique selon la revendication 1, caractérisé en ce que l'émetteur (1) comprenant un programmeur (21) est le même émetteur (1) qui normalement produit un champ d'interrogation dans une zone de détection.

3. Système d'identification électromagnétique selon la revendication 1, caractérisé en ce que l'émetteur (1) comprenant le programmeur (21) comporte un moyen de réglage (25) pour faire varier l'énergie émise, le répondeur (4) comprenant une diode Zener (26) qui limite la tension d'alimentation délivrée par le moyen de redresseur (6) à une valeur de seuil prédéterminée, et le moyen de réglage (25) étant agencé pour régler l'énergie émise à un niveau d'énergie correspondant à ladite valeur de seuil prédéterminée de la tension d'alimentation pendant la programmation.

4. Système d'identification électromagnétique selon la revendication 3, caractérisé en ce que le programmeur (21) est agencé, commerçant depuis le niveau d'énergie correspondant à la valeur de seuil prédéterminée de la tension d'alimentation, pour effectuer une modulation d'amplitude (M) du champ d'interrogation avec une profondeur de modulation ne dépassant pas une valeur maximale prédéterminée.

5. Système d'identification électromagnétique selon la revendication 3 ou 4, caractérisé en ce que

les moyens de détection (3) sont agencés, sur variation de l'énergie émise, pour détecter un changement brusque de la quantité d'énergie absorbée par un répondeur (4) et pour délivrer un signal correspondant au moyen de réglage (25).

6. Système d'identification électromagnétique selon l'une quelconque des revendications précédentes, caractérisé en ce que le moyen de définition de code binaire (24) comprend une mémoire morte programmable effaçable électriquement.

7. Système d'identification électromagnétique selon l'une quelconque des revendications précédentes, caractérisé en ce que l'émetteur (1) est agencé pour produire de manière intermittente un champ d'interrogation et en ce que les répondeurs (4) sont agencés pour produire un signal codé après l'interruption du champ d'interrogation.

8. Système d'identification électromagnétique selon la revendication 7, caractérisé en ce que lesdits répondeurs (4) sont prévus avec un amplificateur (40) qui après l'interruption du champ d'interrogation, en même temps que le circuit récepteur (5) forme un oscillateur accordé à la fréquence du champ d'interrogation et extrait de l'énergie depuis un condensateur shunt d'énergie (8) prévu dans ledit répondeur (4).

9. Système d'identification électromagnétique selon la revendication 8, caractérisé en ce que ledit amplificateur (40) comprend une entrée d'interdiction qui est alimentée dès que le répondeur extrait de l'énergie depuis le circuit récepteur (5).

10. Répondeur pour utilisation dans un système d'identification électromagnétique selon l'une quelconque des revendications 1 à 9.

11. Procédé pour programmer le code d'un répondeur codé (4) qui constitue une partie d'un système d'identification électromagnétique et est agencé pour former l'énergie d'alimentation depuis un champ d'interrogation par l'intermédiaire d'un moyen redresseur (6) et d'un limiteur de tension, et en réponse à un champ d'interrogation pour produire un signal de code pendant des périodes prédéterminées de temps (C1) alternant avec des intervalles de temps (P), ledit signal codé étant en conformité avec un code numérique défini par un moyen de définition de code programmable (24) constituant une partie d'un moyen de codage numérique actif (7) comportant une section de décodage (23), caractérisé en ce qu'un émetteur (1) au moyen duquel un champ d'interrogation peut être produit est prévu d'une manière connue comme avec un programmeur (21) pour moduler ledit champ d'interrogation ; en ce que l'énergie émise par l'émetteur (1) varie lorsqu'un répondeur (4) qui doit être programmé est amené près de l'émetteur ; en ce que le niveau de l'énergie à laquelle un changement brusque se produit dans l'énergie absorbée par le répondeur (4) est détectée ; en ce qu'au moins pendant les intervalles (P) lorsque le répondeur (4) ne produit pas un signal codé, l'émetteur (1) a son niveau d'énergie

ajusté correspondant au niveau d'énergie détecté ; et en ce que ultérieurement, pendant les intervalles (P), le programmeur (21) est alimenté pour moduler le champ d'interrogation en conformité avec un code désiré, lequel code est décodé par la section de décodage (23) et écrit dans le moyen de définition de code (24).

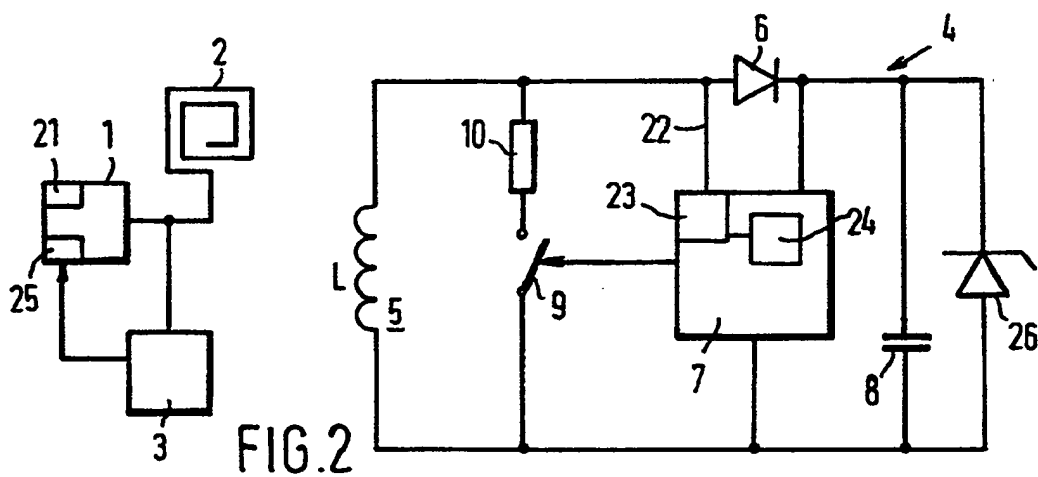
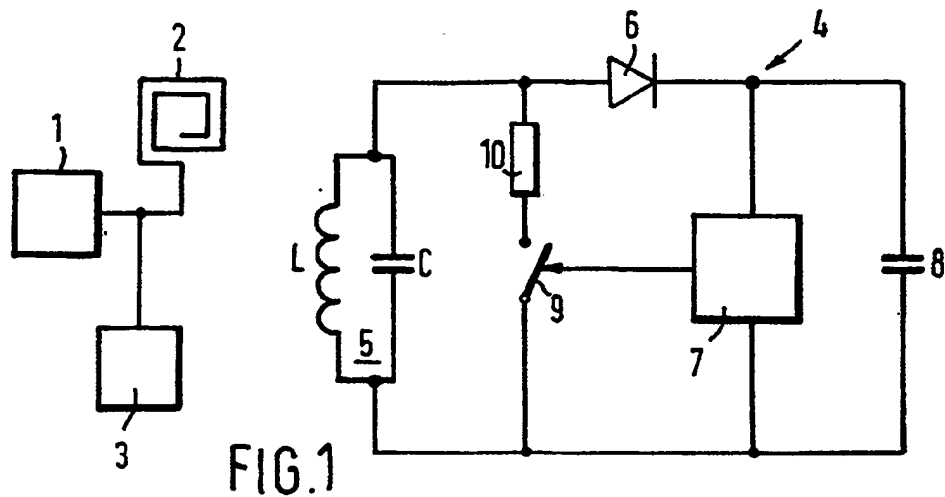


FIG. 3

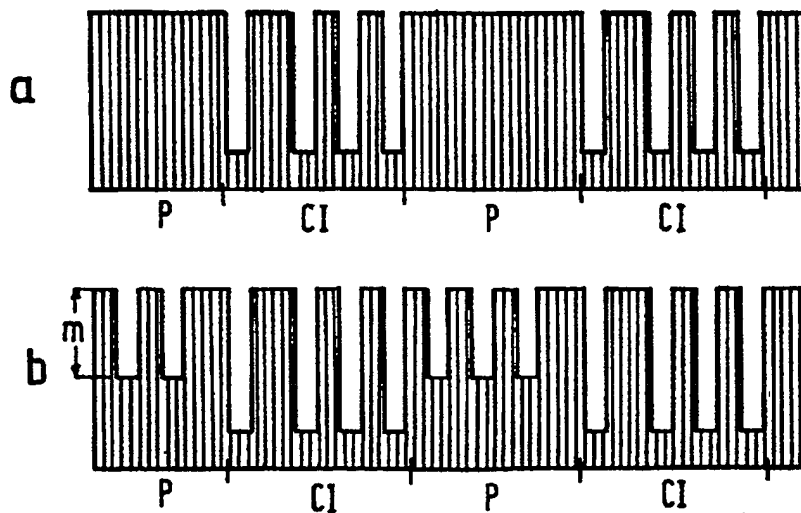


FIG. 4

